

# Coincidence of renal artery stenosis and coronary artery stenosis

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## Aims

The aim of this study was to investigate the prevalence of renal artery stenosis in patients with severe coronary artery disease or stenosis of the left main coronary artery.

## Materials and methods

This cross-sectional study was performed on 264 patients with a history of severe hypertension who were candidates for coronary artery angiography in Yazd Afshar Hospital. During coronary angiography, renal angiography was performed on all of the patients. At the same time, we investigated the renal artery stenosis and its association with a history of diabetes mellitus, high body mass index (BMI), hyperlipidemia, and other cardiovascular risk factors. Renal artery stenosis was defined based on luminal narrowing: mild (50%), moderate (75%), and severe (75%) decrease in luminal diameter. Collected data were analyzed by SPSS software (version 18.0).

## Results

Among 264 patients, 54.92% were males and 45.08 % were females with the average age of 58.0±8.6. 83.71% of the patients had coronary artery disease and included 52.94% hyperglycemic, 63.39% diabetic, and 29.86% smokers. Prevalence of the renal artery stenosis (equal to or more than 50%) was 38.25% in all patients, including 43.56% in men and 56.44%, in women, which shows a significant difference ( $P=0.04$ ). Prevalence of comorbidity of coronary artery disease and renal artery stenosis for 1-vessel, 2-vessels, and 3-vessels disease was 34%, 57.14%, and 54.17%, respectively, that showed a significant difference ( $P<0.01$ ).

## Conclusion

Our findings showed a high prevalence (38.25%) of renal artery stenosis in hypertensive patients with coronary artery diseases. Accordingly, we suggest that simultaneous renal angiography after coronary angiography in hypertensive patients may help to find patients with renal artery stenosis and subsequently better management of these patients.

## Keywords

Renal artery stenosis, Coronary artery stenosis, Hypertension, Coronary artery angiography, Renal angiography

## Imprint

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## Introduction

Renal atherosclerotic stenosis is the most prevalent disease of renal artery that plays an important role in developing and intensifying hypertension and renal atrophy [1, 2]. The prevalence of this disease in society is not completely clear but it has been estimated that 5-10% of hypertensive patients and approximately 17% of hypertensive patients with type 2 diabetes suffer from this disease [3,4].

In recent years, the association between coronary artery disease and the prevalence of renal artery stenosis has been studied a lot. Some studies have mentioned a strong relationship between coronary artery disease and the prevalence of renal artery stenosis [11] and some have investigated coronary artery disease risk factors that can lead to renal artery stenosis. However, the results of these studies are very different and sometimes antithetic. According to the difference in prevalence of heart disease risk factors in various societies, it seems that predictive risk factors of renal artery stenosis in heart disease are also different in various societies [12]. As a result, this study is aimed at investigating this relationship and predicting the future of the society of Iranian hypertensive patients.

## Materials and methods

This cross-sectional study was performed in angiography center in the cardiac ward of Yazd Afshar Hospital during the second half of the year 2010. The studied population include the patients with history of hypertension who were candidates for coronary artery angiography by an informed consent. The subjects of this study were selected by convenience and sequential sampling method from among the patients eligible for participating in the study. Diagnosed hypertension under treatment, two measurements of systolic blood pressure of higher than or equal to 140 mm Hg and diastolic blood pressure of higher than or equal to 90 mm Hg, and the written consent were the inclusion criteria. The patients who lacked appropriate hemodynamic conditions during angiography were excluded. Before angiography, a collection form containing demographic data, diabetes, and smoking, in addition to examining blood pressure, height and weight were recorded by conductors. Their blood pressure was taken twice and those with blood pressure higher than or equal to 140/90 mm Hg were included in the study. During coronary angiography, renal angiography was performed, non-selectively through abdominal aortography and selectively through renal artery injection of 10 cc contrast material in both kidney arteries. According to severity stenosis of renal artery from origin to bifurcation, patients were categorized into three groups of mild stenosis (50%), moderate stenosis (50-75%), and severe stenosis (more than 75%). Subsequently, two cardiologists expressed their observations and artery diameter stenosis as well as renal artery stenosis rate were based on their observations. At least 50% of diameter stenosis of the coronary artery (LCX, RCA, and LAD) or one of their main branches was considered as coronary artery stenosis. Left main coronary artery stenosis (LM) was considered as 2-vessels stenosis. This study protocol has been approved by Yazd Cardiovascular Research Center's committee on human research.

Qualitative data were expressed through percentage and quantitative data were illustrated by mean and standard deviation. Qualitative variables were compared by Chi-square test or Fisher's exact test and quantitative variables were compared by Student's t-test. Version 18 of SPSS software was used for statistical analysis and a P-value of less than 0.05 was considered as significant probability.

## Results

264 patients, consisting of 145 (%54.92) men and 119 (%45.08) women, with hypertension who were candidates for coronary artery angiography were studied. The number of patients with coronary artery disease was 221 (83.71%).

The mean age of patients was  $57.0 \pm 8.6$ . Minimum and maximum ages were 31 and 87, respectively. The mean age was  $58.9 \pm 9.3$  for patients with renal artery stenosis and  $55.9 \pm 7.5$  for patients without renal artery stenosis. According to Student's t-test, mean age was not significantly different between two groups ( $p=0.09$ ).

Of 264 patients studied the prevalence of renal artery stenosis (narrowing of the diameter equal to or more than 50%) was 114 (43.1 which was respectively 43.56 % (44 patients) and 56.44 % (57 patients) in men and women ( $p<0.001$ ) (Table2). Among 264 studied patients, 114 (43.1%) had renal artery stenosis, including 44 men (43.56%) and 57 women (56.44%) ( $P<0.001$ ) (Table 2).

Coincidence of renal artery stenosis and coronary artery stenosis was 45.7 % (101 of 221 patients)

Based on chi-square test the mean age of men and women was significantly different ( $P = 0.04$ ).

Diagram 1 shows the severity of renal stenosis in CAD patients. 45.7% of patients had renal artery stenosis. The majority of them had mild and moderate stenosis.

Among 221 patients, a total of 100 (45.25 %) were involved in 1-vessel coronary artery disease, 34 of them (34%) had simultaneous renal artery stenosis. In addition, 49 patients (22.17%) had two-vessel involvement. Among them, 28 cases (57.14%) had simultaneous renal artery stenosis. 72 patients (32.58 %) had three-vessel involvement that 39 (54.17%) of them had simultaneous renal artery stenosis.

## Discussion and conclusion

In the present study, the prevalence of renal artery stenosis in hypertensive patients undergoing coronary angiography was 43.18% that was estimated 43.56% and %56.44 in men and women, respectively. In the study of Edalatifard et al. in 2010 [17], the prevalence of renal artery stenosis was %25.3, which is less than that of the present study. In the study of Ebrahimi et al. [18] in 2005 on patients who were candidate for coronary angiography in Mashhad, 31% of hypertensive patients had renal artery stenosis and coronary

Table1: Demographic and clinical features in CAD patients with renal artery stenosis

Risk factor	Mild stenosis <50%	Moderate stenosis 50–75%	Sever stenosis >75%	Total %
Male No(%)	20(38.46)	22(53.66)	2(4.55)	44(43.56)
Diabetes mellitus No(%)	36(69.23)	18(43.90)	7(87.5)	61(60.40)
Hyperlipidemia No(%)	24(46.15)	12(29.27)	4(50.0)	40(39.60)
Smoking No(%)	13(25)	16(39.02)	3(37.5)	32(31.68)
Age (y) Mean±SD	9.00±58.10	3.80±51.2	5.80±62.2	56.12±12.8
BMI (Kg/m2) Mean±SD	3.80±29.18	4.22±29.01	1.55±28.18	3.42±29.0

Table 2: Demographic and clinical factors according to renal artery stenosis

Risk factor	Renal stenosis No	Non Renal stenosis No	P-Value
Male	44(43.56)	86 (71.66)	0.001
Diabetes mellitus history	61(60.40)	79(65.83)	0.087
Hyperlipidemia history	40(39.60)	77 (64.17)	0.03
Smoking history	32(31.68)	34(28.33)	0.11
Age (y)	8.12± 56.12	4.8± 46.2	0.042
BMI (Kg/m2)	3.42± 29.0	2.25± 29.08	0.11

\*(%), \*\* SD ± Mean

artery disease. The results of this study were close to ours. Comparing to other similar studies, the results of Ebrahimi et al. [18] and the results from this study show an increase in the prevalence of renal artery stenosis in patients with coronary artery disease. This could be due to investigation of the prevalence of renal artery stenosis in hypertensive patients.

Also in this study, renal artery stenosis of more than 50% was observed in 45.7% of patients with coronary artery disease which is higher than those of the studies of Edalatifard et al. (17.1%) and Ebrahimi et al (%21) [17,18]. This partly reflects the increasing prevalence of renal artery stenosis in hypertensive patients with coronary artery disease. In the aforementioned studies, the prevalence of renal artery stenosis in patients with coronary disease confirmed by angiography was higher than other procedures (28-39 % vs. 9-14.5% in Edalatifard study). Similar results were obtained in the present study, and this indicates the close relationship of atherosclerosis in coronary and renal artery. In several studies, in addition to characterization of the prevalence of renal artery stenosis, an attempt has been made to identify risk factors and predictors of disease. In the study of Alhaddad in 2001, coronary artery stenosis was considered as an important factor in the prediction of renal artery stenosis [19]. In Aqel's study (2003), besides the age and renal function, pe-

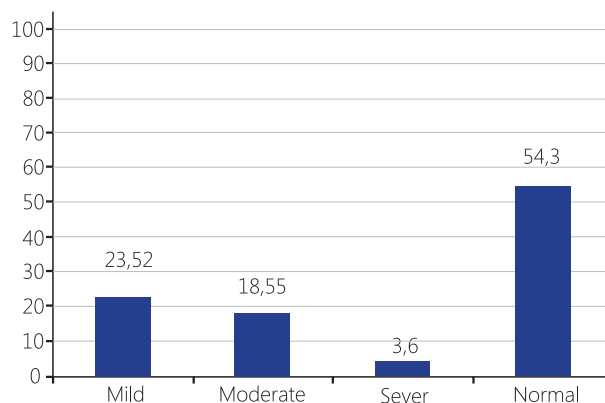


Diagram 1: Severity of renal stenosis in CAD patients

ripheral vascular disease is mentioned as a predictor of renal artery stenosis instead of coronary heart disease. in 28% of patients, over 50% of renal artery stenosis and in 16% of them, over 75% of renal artery stenosis were reported [20]. In this study, female gender has been proposed as a predictor affecting renal artery stenosis. This finding is emphasized in Cohen's study as well [21].

In our study, the number of men with CAD were more than women (54.92 vs. 45.80%), but in women with renal artery stenosis, coronary artery disease was more severe (56.44% of women vs. 43.56% of men). Unlike Alhaddad [15], the results of this study confirm the results of Aqel [20], Buller [22], and Cohen [21]. This shows the potential impact of female gender on

renal artery stenosis independent of other risk factors in the study of Edalatfard et al., female gender is considered a factor of renal artery stenosis independent of other risk factors [17]. Other studies on the prevalence of heart disease in Iran have shown that female gender is known as a main risk factor in the occurrence and development of renal artery stenosis [23].

In earlier studies such as Harding in 1992, female gender is considered important as well as age. In Harding's study on patients with or without hypertension who were candidate for coronary angiography, 30% of patients showed a degree of renal artery stenosis and only 11% had stenosis of more than 50%. However, in this study, instead of the number of involved coronary arteries and the severity of coronary artery stenosis, peripheral vascular disease was identified as an important factor [24].

In Liu study the prevalence of renal artery stenosis in 141 patients who underwent coronary angiography was totally 18.2%, but in the presence of coronary stenosis this ratio increased to 30.8%. [25].

In this study the frequency of coronary artery stenosis associated with renal artery disease was significantly higher than the frequency of coronary artery disease without renal artery stenosis which is consistent with the results of the present study.

Studies show that the prevalence of three-vessel involvement in coronary artery disease in Iranian society is considerably more than other communities [23]. In our study, the incidence of involvement of three vessels in patients with CAD was 54.17% and 54.17% of CAD patients had simultaneous renal artery stenosis and three-vessel involvement.

Edalatfard et al [17] believe that the close relationship between the development of hypertension and renal artery stenosis is because in many patients, especially women, high blood pressure is not appropriately controlled by medication. However, in Aqel study no relationship has been found between the control of hypertension and renal artery stenosis [20].

The results show that signs and symptoms of coronary artery disease can be a suggestion of renal artery stenosis in patients. Wierema study in 2009 suggests that renal artery stenosis in patients with coronary artery stenosis increases the risk of mortality in these patients and the growth of mortality is directly related to the severity of renal artery stenosis in these patients [26]. Zuccala et al. stated that because atherosclerosis is the primary cause of renal artery stenosis

and the involvement of coronary arteries and all arteries including the coronary arteries can be involved, as a result in coronary artery atherosclerosis people, are at greater risk of atherosclerosis of the renal artery disease [9].

Results showed that in a significant number of hypertensive patients with severe coronary artery disease, renal artery is stenotic. Due to serious and irreversible complications of renal artery stenosis such as renal failure, it is recommended that during coronary angiography in patients with chronic hypertension, especially in women, renal artery angiography should be performed as well for the early detection of renal artery stenosis and taking necessary preventive management.

### Statement on ethical issues

Research involving people and/or animals is in full compliance with current national and international ethical standards.

### Conflict of interest

None declared.

### Author contributions

All the authors read the ICMJE criteria for authorship and approved the final manuscript.

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